

Recycled Does Not Mean Weaker

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Why Was This Project Chosen?

- Advancements in the recycling process and a social push towards a more eco friendly production stream

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Brief History

- 1031 - First Instance of Paper Recycling found in Japan



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Brief History

- 1690 – Rittenhouse Mill Philadelphia USA



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Brief History

- 1896 – Benedetto Family



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Brief History

- 1993 – More paper recycled than thrown away



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How Paper is Recycled Today

- Paper is taken from blue recycling bins
- Separated
- Mixed with water to create a slurry
- Slurry created into paper
 - *Through additives and addition of virgin fibers*

Project Scope

- To test the endurance of virgin fiber papers and recycled fiber papers and analyze paper bonds between the substrates.
- To see exactly by how much recycled fiber papers are weakened due to the recycling process.
- To see how various inks change the results.

Equipment Used

- *The folding endurance tester* - M.I.T. Tinius Olsen
- *A microscope* - Dino-Lite
- *A QuickPeek kit* - Thwing-Albert
- *Phantom proofer QD* - HarperScientific

Materials Used

- *Lithographic Ink* - HuberGroup
- *Flexographic Ink* – Siegwark
- Papers supplied through Spicers (50# to 70#):
 - *Domtar*
 - *International*
 - *Rolland*

Experiment Procedure

- Papers inked and dried for 24 hours.
- 10 samples of grain long and 10 samples of grain short measured using endurance tester.
- Tears evaluated through a microscope.

Data Collected

Weight	Type	Fiber	Company	grain long	grain short	grain long offset	grain short offset	grain long flex	grain short flex	Average
70#	offset smooth text	virgin	Domtar	29	18	10	6	4	4	11
60#	offset smooth text	virgin	Domtar	33	18	11	8	22	8	15
50#	offset smooth text	virgin	Domtar	85	19	23	8	5	15	18
70#	cougar smooth text	virgin	Domtar	11	28	9	3	8	8	16
60#	cougar smooth text	virgin	Domtar	12	9	6	7	19	14	9
50#	smooth text	virgin	Domtar	21	22	3	2	3	8	9
70#	smooth text	virgin	Rolland	11	4	8	5	7	8	8
60#	smooth text	virgin	Rolland	3	8	9	4	5	7	6
50#	smooth text	virgin	Rolland	25	16	5	7	4	9	10
70#	smooth text	virgin	International	3	13	3	6	7	4	6
60#	smooth text	virgin	International	14	15	8	8	10	8	8
50#	smooth text	virgin	International	4	7	4	5	7	8	6
70#	ultra smooth text	virgin	Domtar	32	8	12	3	7	5	10
60#	ultra smooth text	virgin	Domtar	19	14	5	8	7	27	10
50#	ultra smooth text	virgin	Domtar	54	4	36	8	10	30	28
70#	batix text	E-mission	Rolland	21	16	8	5	7	6	10
60#	batix text	E-mission	Rolland	30	38	19	10	20	9	18
50#	batix text	E-mission	Rolland	11	18	7	3	12	8	9
70#	print text	E-mission	Rolland	19	22	10	6	12	4	13
60#	print text	E-mission	Rolland	14	21	22	12	24	37	17
50#	print text	E-mission	Rolland	29	24	11	3	25	7	15

No Ink Results

- Virgin Fiber:
 - Grain Long: 25
 - Grain Short: 13
- Recycled Fiber:
 - Grain Long: 21
 - Grain Short: 23
- 14.46% Difference

Weight	Type	Fiber	Company	grain long	grain short
70#	offset smooth text	virgin	Domtar	29	18
60#	offset smooth text	virgin	Domtar	33	18
50#	offset smooth text	virgin	Domtar	31	19
70#	cougar smooth text	virgin	Domtar	11	5
60#	cougar smooth text	virgin	Domtar	12	9
50#	smooth text	virgin	Domtar	21	22
70#	smooth text	virgin	Rolland	11	8
60#	smooth text	virgin	Rolland	8	8
50#	smooth text	virgin	Rolland	25	16
70#	smooth text	virgin	International	8	13
60#	smooth text	virgin	International	14	15
50#	smooth text	virgin	International	9	7
70#	ultra smooth text	virgin	Domtar	32	8
60#	ultra smooth text	virgin	Domtar	19	14
50#	ultra smooth text	virgin	Domtar	34	9
70#	satin text	Emersonment	Rolland	21	16
60#	satin text	Emersonment	Rolland	30	20
50#	satin text	Emersonment	Rolland	11	19
70#	print text	Emersonment	Rolland	19	22
60#	print text	Emersonment	Rolland	14	23
50#	print text	Emersonment	Rolland	29	24

Offset Lithographic Ink Results

- Virgin Fiber:
 - Grain Long: 11
 - Grain Short: 6
- Recycled Fiber:
 - Grain Long: 14
 - Grain Short: 7
- 21.56% Difference

Weight	Type	Fiber	Company	grain long offset	grain short offset
70#	offset smooth text	virgin	Domtar	10	6
60#	offset smooth text	virgin	Domtar	11	8
50#	offset smooth text	virgin	Domtar	23	8
70#	cougar smooth text	virgin	Domtar	9	8
60#	cougar smooth text	virgin	Domtar	5	7
50#	smooth text	virgin	Domtar	9	20
70#	smooth text	virgin	Rolland	8	5
60#	smooth text	virgin	Rolland	9	4
50#	smooth text	virgin	Rolland	5	7
70#	smooth text	virgin	International	8	6
60#	smooth text	virgin	International	9	8
50#	smooth text	virgin	International	4	5
70#	ultra smooth text	virgin	Domtar	12	8
60#	ultra smooth text	virgin	Domtar	5	6
50#	ultra smooth text	virgin	Domtar	36	9
70#	satin text	Emersonment	Rolland	8	5
60#	satin text	Emersonment	Rolland	19	16
50#	satin text	Emersonment	Rolland	7	5
70#	print text	Emersonment	Rolland	16	6
60#	print text	Emersonment	Rolland	22	10
50#	print text	Emersonment	Rolland	11	8

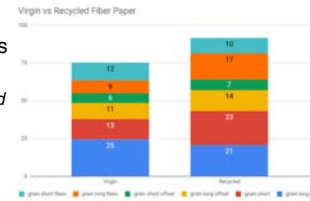
Flexographic Ink Results

- Virgin Fiber:
 - Grain Long: 9
 - Grain Short: 12
- Recycled Fiber:
 - Grain Long: 17
 - Grain Short: 10
- 35.9% Difference

Weight	Type	Fiber	Company	grain long flexo	grain short flexo
70#	offset smooth text	virgin	Domtar	4	5
60#	offset smooth text	virgin	Domtar	22	8
50#	offset smooth text	virgin	Domtar	3	15
70#	cougar smooth text	virgin	Domtar	3	8
60#	cougar smooth text	virgin	Domtar	16	14
50#	smooth text	virgin	Domtar	5	8
70#	smooth text	virgin	Rolland	7	5
60#	smooth text	virgin	Rolland	5	7
50#	smooth text	virgin	Rolland	4	9
70#	smooth text	virgin	International	7	4
60#	smooth text	virgin	International	10	8
50#	smooth text	virgin	International	7	8
70#	ultra smooth text	virgin	Domtar	7	5
60#	ultra smooth text	virgin	Domtar	7	27
50#	ultra smooth text	virgin	Domtar	10	28
70#	satin text	Emersonment	Rolland	7	6
60#	satin text	Emersonment	Rolland	20	9
50#	satin text	Emersonment	Rolland	12	5
70#	print text	Emersonment	Rolland	12	8
60#	print text	Emersonment	Rolland	26	27
50#	print text	Emersonment	Rolland	25	7

Virgin Fiber vs Recycled Fiber Overall

- The Average folding endurance for all papers is 11.
- 4 out of 6 of the recycled fiber papers exceeded the average.



Microscopic Image Analysis



Virgin

Recycled

What Does This Mean?

- The study shows that in some cases recycled fibers may be able to be as good or even outperform virgin fiber papers.
- Recycled fiber papers have come a long way from being "The Weaker Paper".
- Please note that this is a small sample of all the available papers products out there.

What Does This Mean For The Future?

- One day we can confidently say for all of our printed products:

“Recycled does not mean weaker”

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